



Earth, Science, Technology: Growing With You

"On Farm" Thermal Energy Recovery From Cattle Manure and Bedding Composting

The Vermont Project



"On Farm" Thermal Energy Recovery From Cattle Manure and Bedding Composting

The demonstration hot water thermal energy plant is located outside the village of Enosburg Falls in Northern Vermont on a 2000 head heifer to dairy cow operation owned by Terry and Joanne Magnan.

System Information

The plant utilizes two composting bays each designed to accommodate four windrows of blended manure, bedding and other carbon source materials.

System Information

At present, the west facing bay is operational. the east facing bay will be completed in 2007.

System Information

Each bay composts four windrows at one time, each containing between 360,000 to 400,000 LBS of blended compostable materials for a total maximum load of 1,444,000 to 1,600,000 LBS per bay.

System Information

The moisture content of the feedstocks is in the range of 60%

The moisture content of the finished compost is in the range of 40%

System Information

The bio-thermodynamic reaction occurring within the composting process converts water resident in the feedstocks mixture from liquid to vapor.

System Information

The work done by thermophillic bacteria to accomplish this phase change results in a latent heat input to the water vapor of 1,000 BTUs / pound of water converted from liquid to vapor

System Information

Each windrow therefore produces, over the duration of the composting cycle, 76,000,000 BTUs.

System Information

The system uses forced negative aeration, drawing ambient air through the windrows and into floor ducts connected to a condensation chamber

System Information

Energy is captured by condensing the vapor on an array of superthermal conductors located within the condensation chamber. These conductors are integrated with an insulated water storage tank

System Information

Condensate produced by this energy capture process is used to irrigate the windrows in the composting bay.

System Information

Irrigation prevents dry out, allowing for more vapour generation and therefore more energy capture.

System Information

A typical composting process duration of 21 days results in each windrow potentially producing 3,620,000 BTUs per day (24Hour period)

System Information

Outputs and Value streams:

- 1) Thermal energy for “on farm” heating and process applications in the form of hot water produced at a minimum rate in excess of 3,000,000 BTUs per day.

System Information

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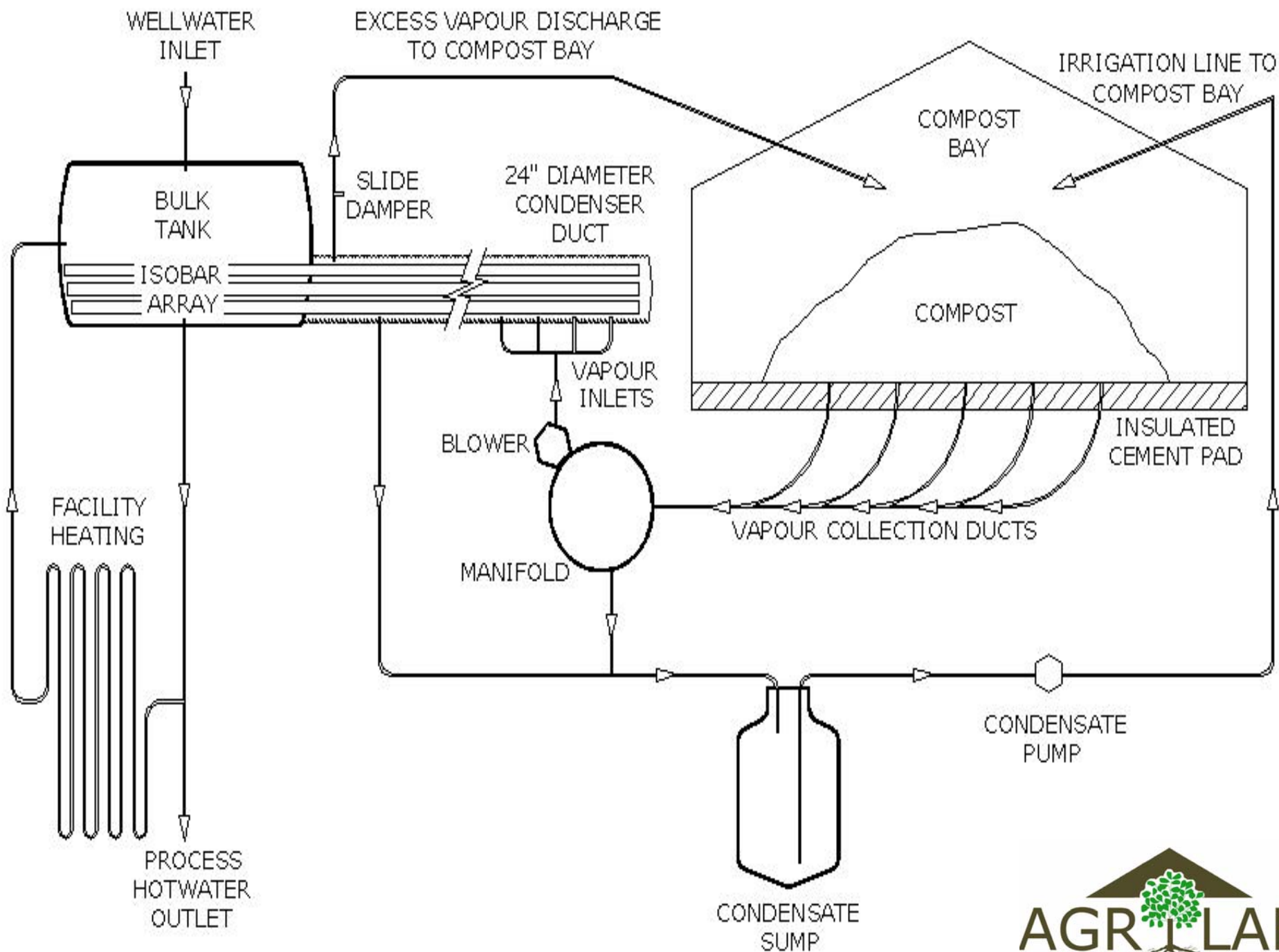
2) Remediated manure free of pathogens and ready for field spreading

System Information

Outputs and value streams:

3) 60,000 to 90,000 LBS of high grade compost per week per bay for field spread and sale to retail and wholesale markets



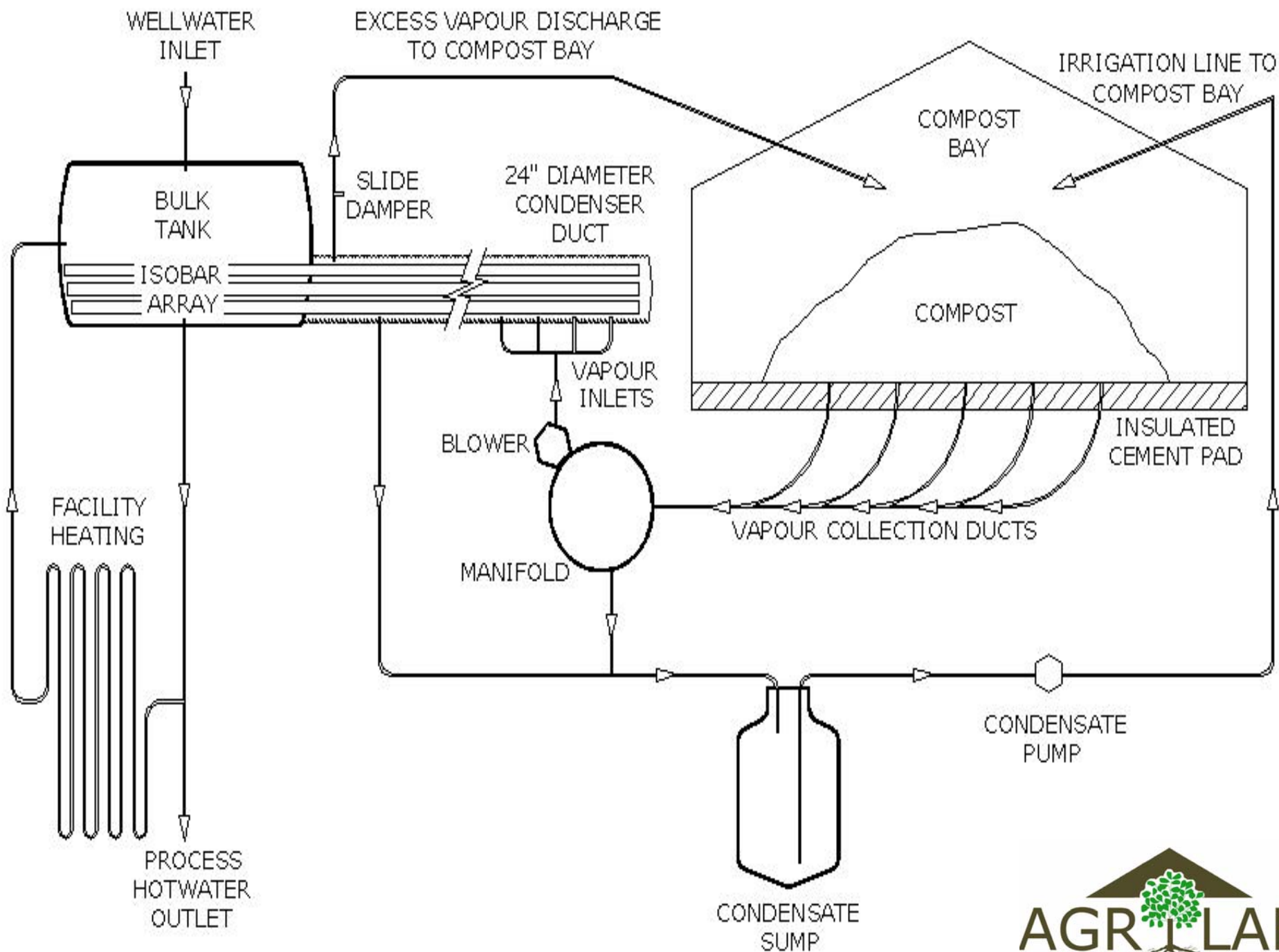






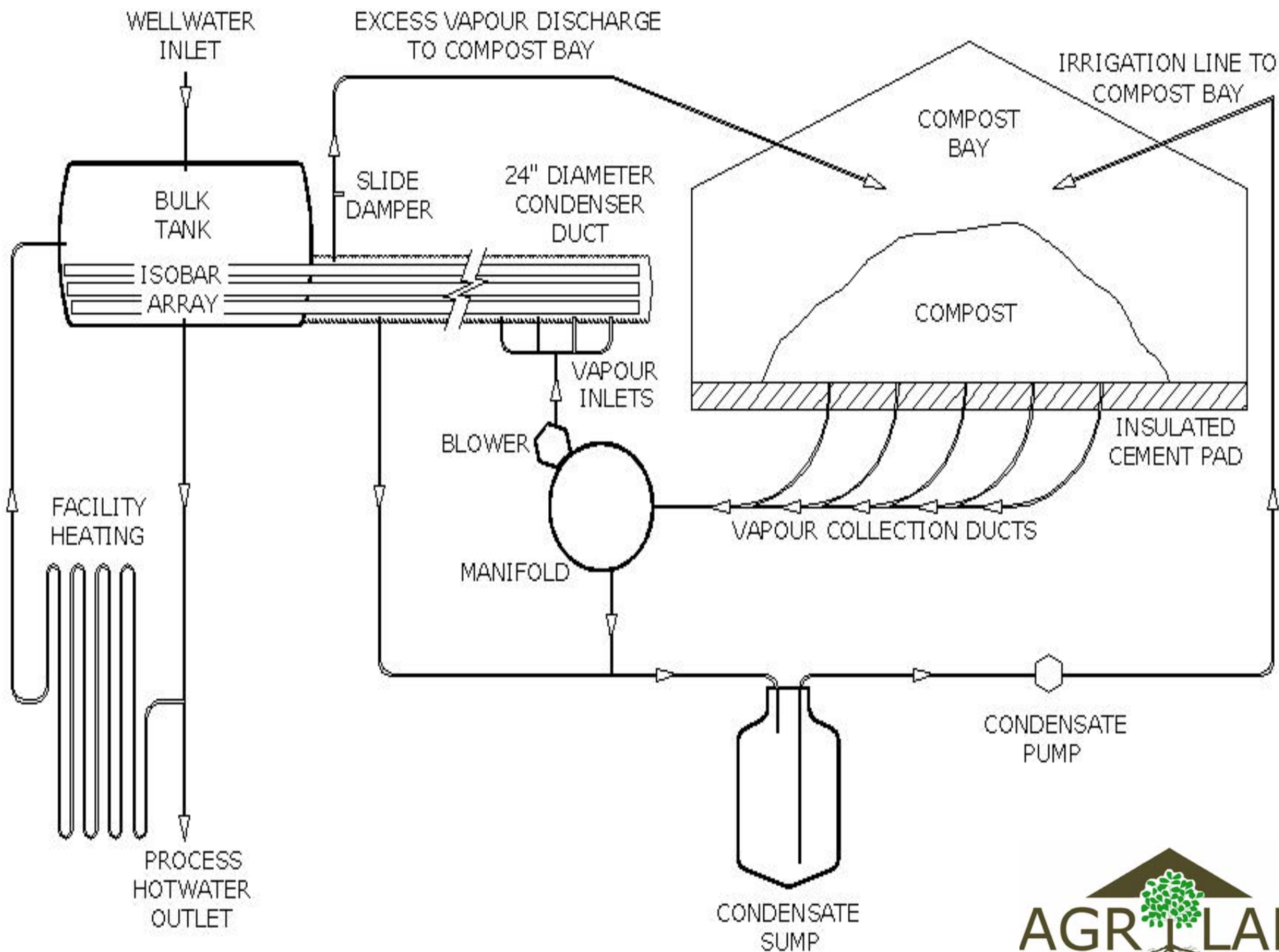












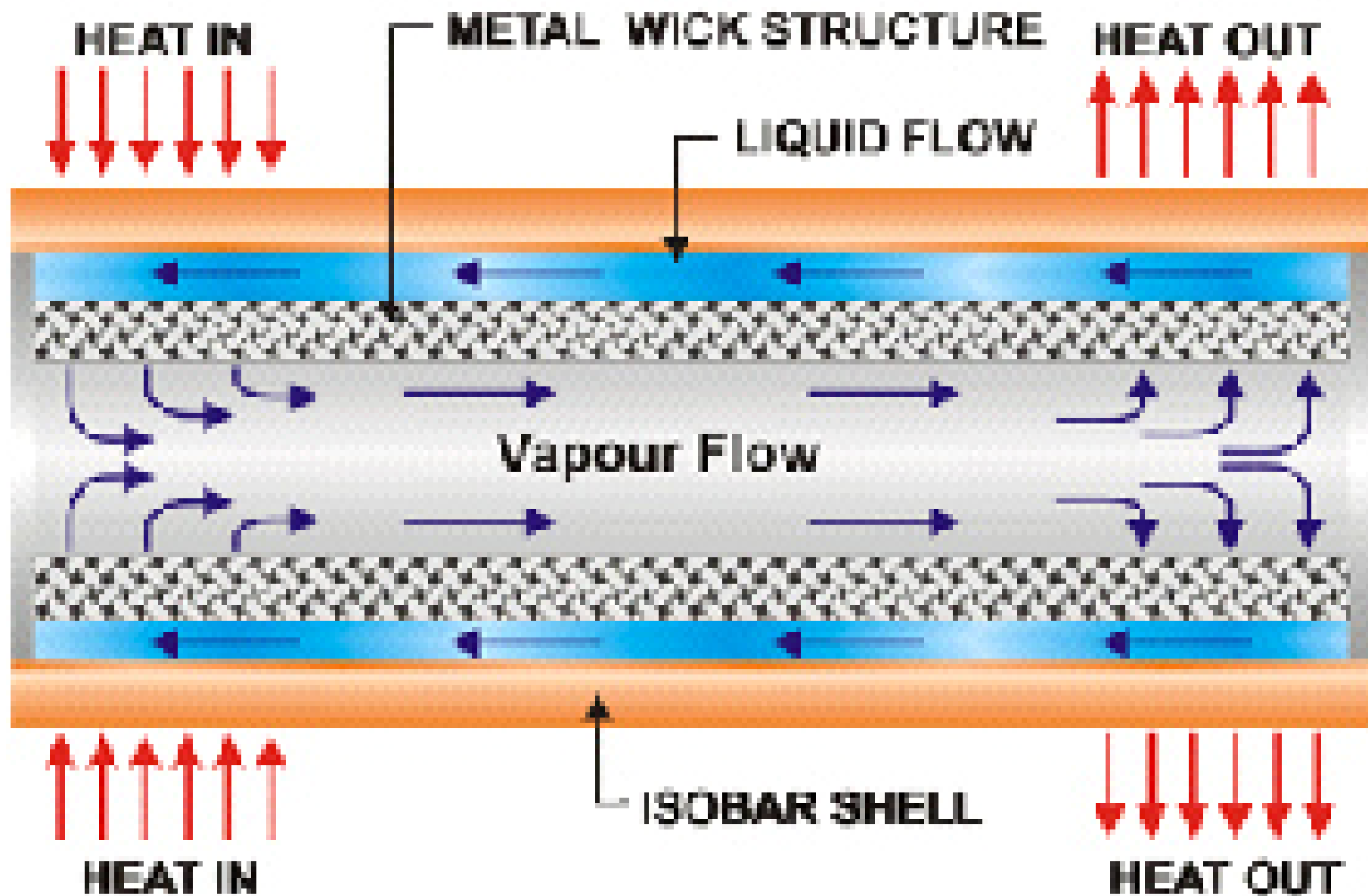












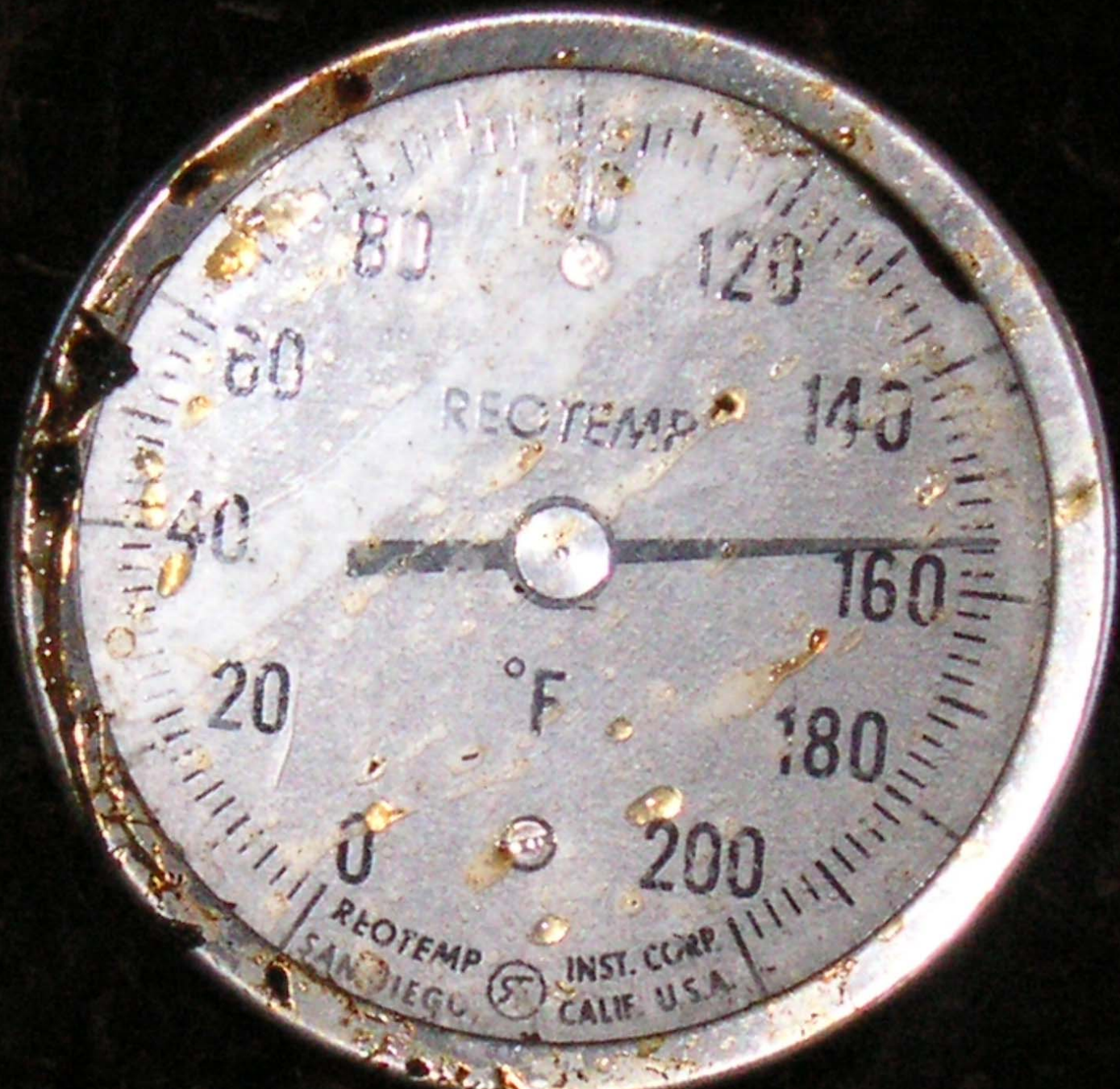








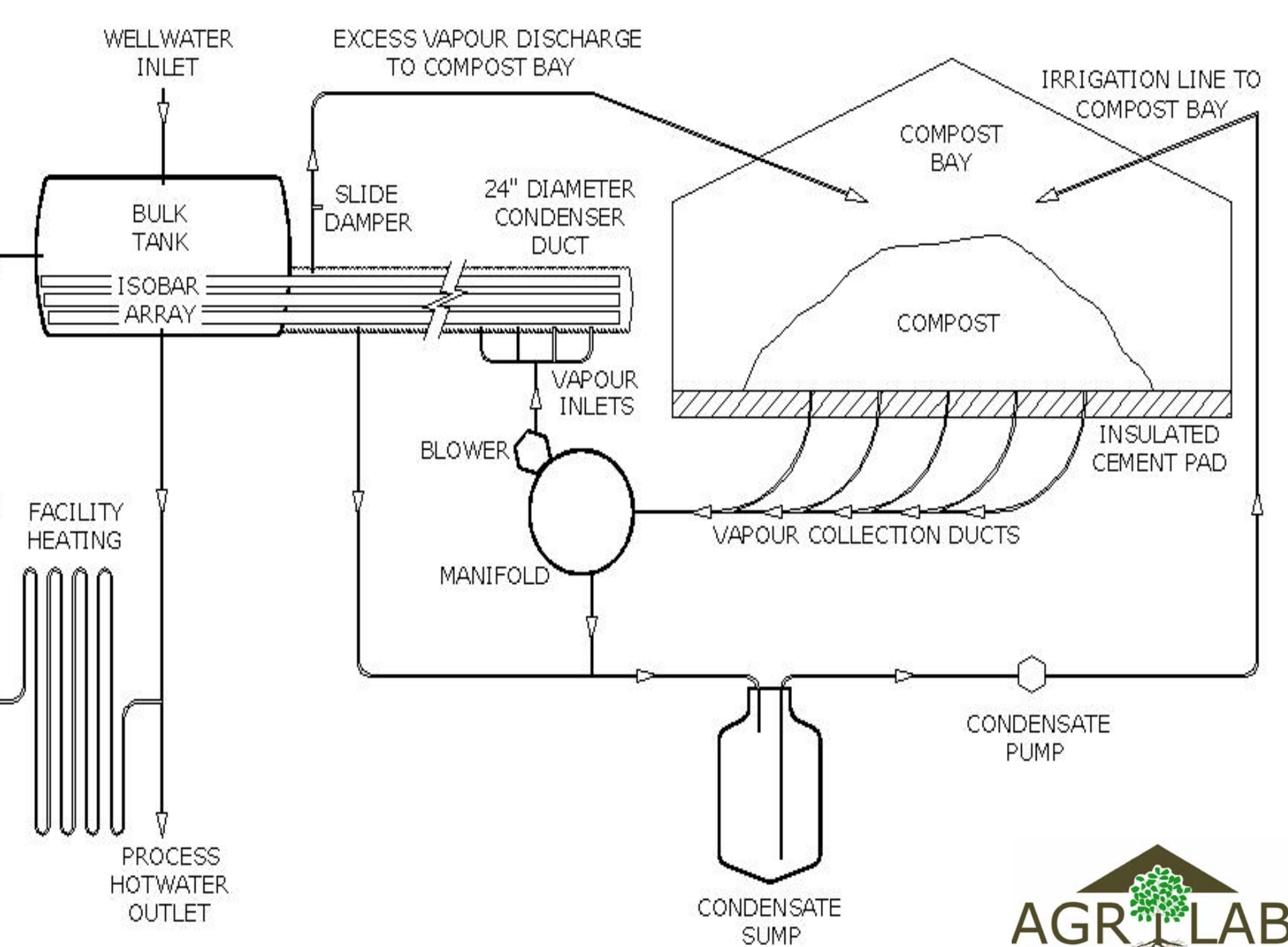






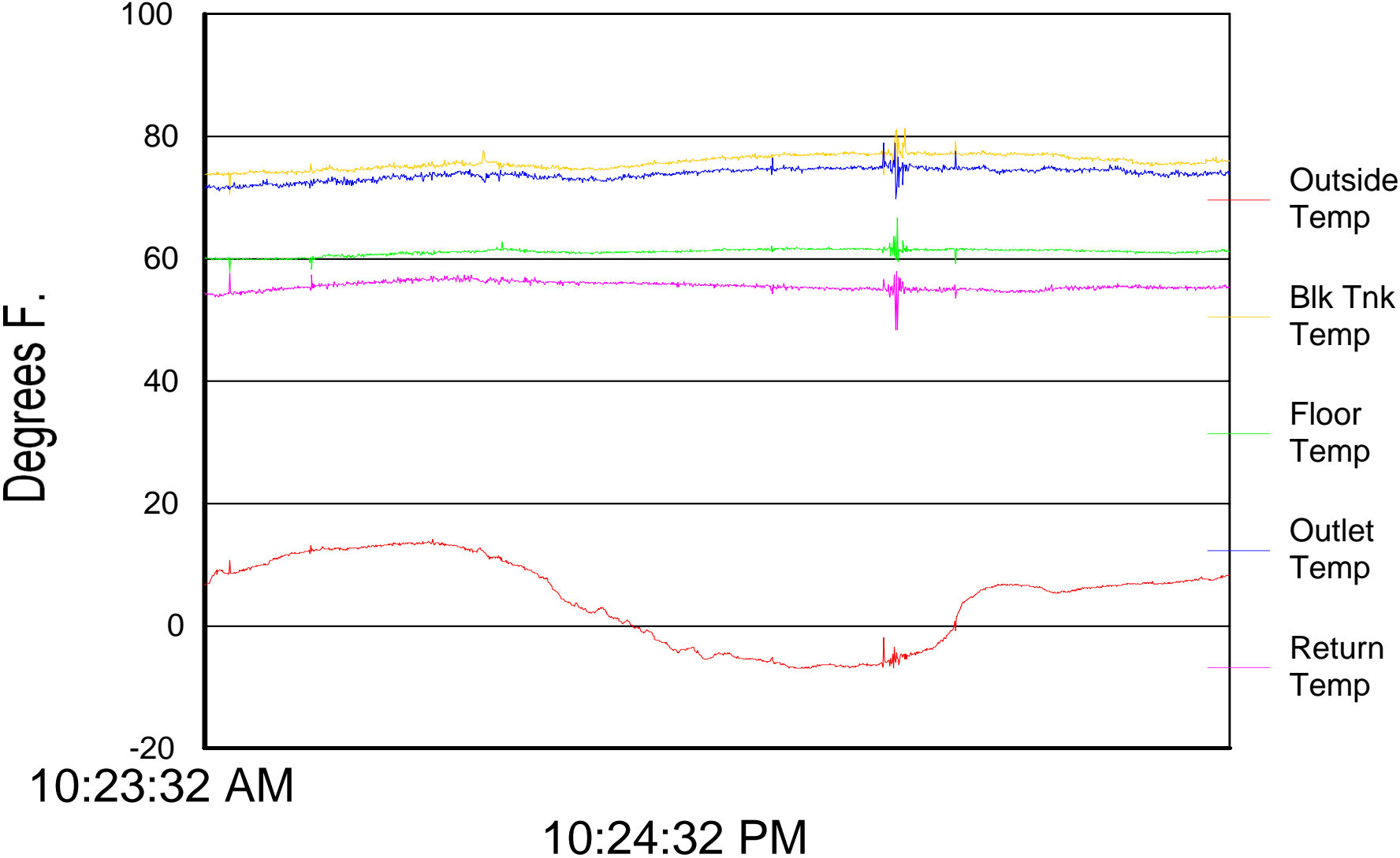


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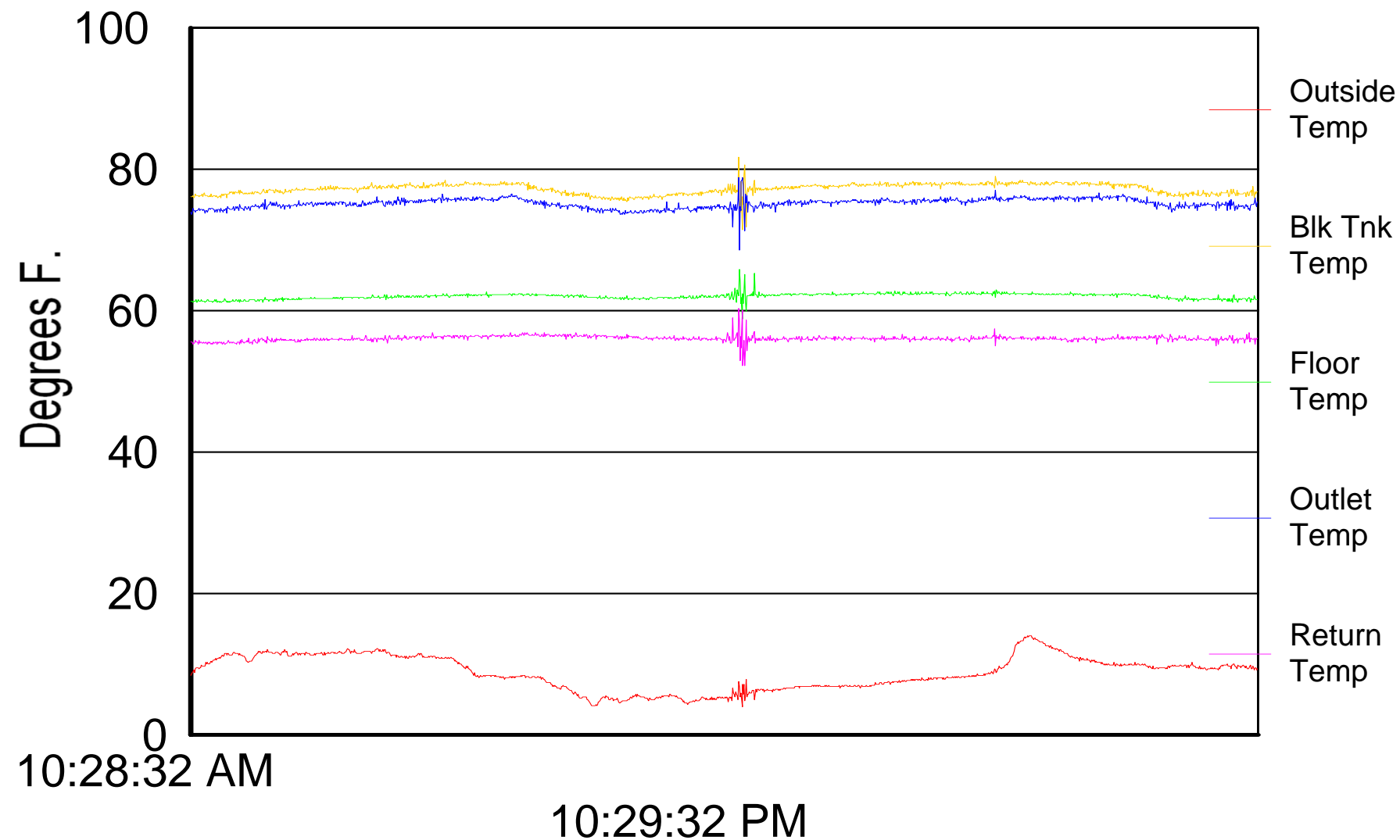


Hot water generated in this fashion is operationally at no cost and is an effective energy source for heating greenhouses, process water requirements for food processing and packing plants as well as facility heating.

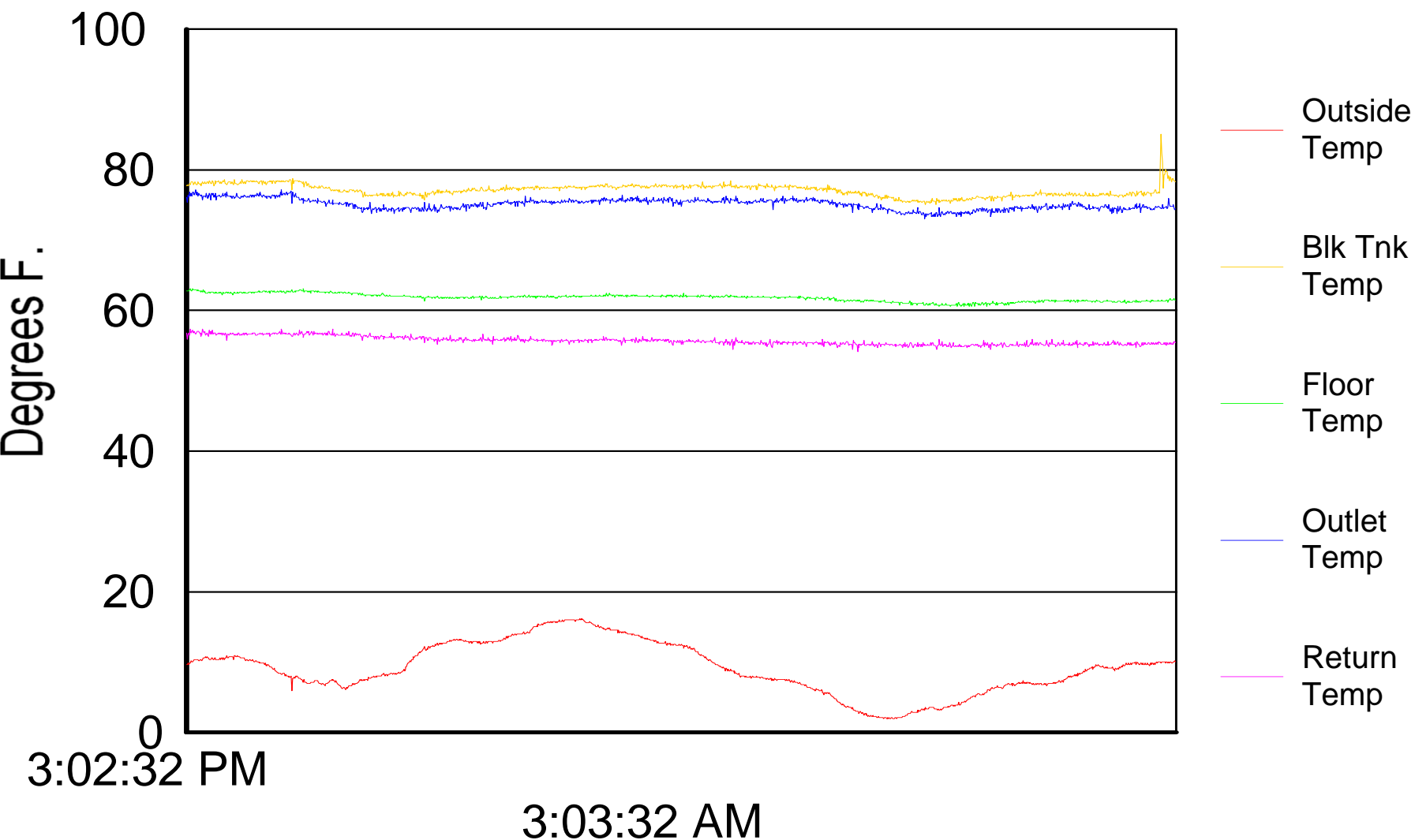
System Performance Feb 06 2007 24 Hr.



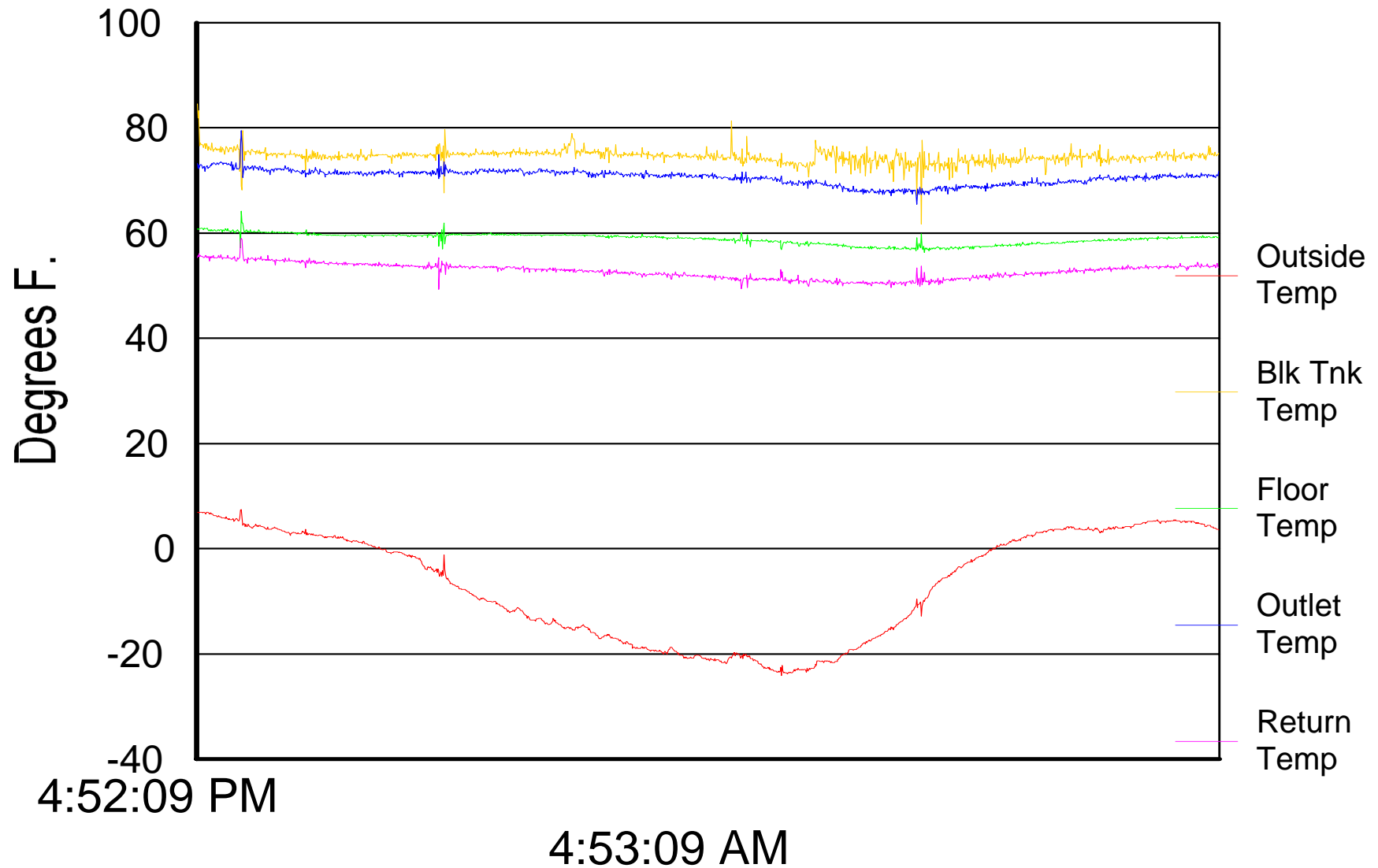
System Performance Feb 07 2007 24 Hr.



System Performance Feb 08 2007 24 Hr.



System Performance Feb 12 2007 24 Hr.



With only Windrows #2 & #3 functional the system produced A continuous 3.5 million BTUs of energy per day while outside temperatures varied between 10F and -25F maintaining the floor temp at a near constant of 60F

Value Streams

Thermal energy for “on farm”
Applications, demonstrated
at 3 million BTUs per day.

Safe High grade compost for field
spread or retail/wholesale sales

Thank you